

**REMARKS**

Claims 16-17, 20-21, 23-24, and 27-28 are currently being amended to further particularly point out and distinctly claim the subject matter which Applicant regards as the inventive subject matter. Additionally, claim 25 is being cancelled to obviate the Examiner's objection.

The amendments herein do not introduce new matter within the meaning of 35 U.S.C. §132. Accordingly, entry of the amendments is respectfully requested.

**1. Objection of Claims 20, 21, and 23-25**

The Office Action states,

Claims 20, 21, 23, 24, and 25 are objected to because of the following informalities: The claims indicate that the at least one activating compound is optional. There is no evidence in the record that active catalysts containing the claimed metallocene do not contain at least one activating compound. Appropriate correction is required.

Claim 25 is objected to under 37 CFR 1.75 as being a substantial duplicate of claim 24. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

Claim 24 is drawn to a process comprising copolymerizing ethylene and  $\alpha$ -olefins in the presence of a catalyst system wherein the process produces a copolymer of ethylene with  $\alpha$ -olefins exhibiting certain properties. Claim 25 is drawn to a process for preparing a copolymer of ethylene with  $\alpha$ -olefins exhibiting certain properties comprising polymerizing ethylene with  $\alpha$ -olefins in the presence of a catalyst system.

The catalyst system and the properties recited in both sets

of claims are identical. Therefore, despite the slight difference in wording, the subject matter of claim 25 appears to be a substantial duplicate of claim 24.

### **RESPONSE**

Applicant respectfully traverses the Examiner's objection relating to claims 20, 21, and 23-25. Basis for the currently claimed activating compound being optional can be found throughout the specification, and in particular on page 5, line 7; page 16, line 3; and page 31, lines 16-20. Accordingly, Applicant respectfully requests the Examiner to withdraw the current objection.

With respect to the objection to claims 24 and 25, Applicant has cancelled claim 25. Accordingly, Applicant respectfully requests the Examiner to withdraw the current objection.

### **2. Rejection of Claims 16-20, 28, and 29 Under 35 U.S.C.**

#### **§102(b)/103(a)**

The Office Action states that claims 16-20, 28, and 29 are rejected under 35 U.S.C. §102(b) as being anticipated by, or in the alternative under 35 U.S.C. §103(a) as being obvious over Wang, et al. (WO 01/92346, the U.S. equivalent being U.S. Patent 6,723,675). In particular, the Office Action states,

Wang et al. teaches a catalyst and use of the catalyst in a process of polymerizing ethylene and  $\alpha$ -olefin (claims 7 and 12). The bridged complex, (2-pyridylmethyl)(Ind)CrCl<sub>2</sub> is representative (example 5). Clearly, the process of the

prior art is essentially as that described in claims 20 and 29, and it follows that the products prepared by essentially the same process will exhibit essentially the same properties. Therefore, it is maintained that the copolymer prepared by Wang et al. inherently possesses the properties recited in claims 16-20. The subject matter of claim 28 is disclosed in column 3, line 10, in which Wang et al. teaches molded articles and films as end use for inventive polymers.

#### RESPONSE

Applicant respectfully traverses the rejection of claims 16-20, 28, and 29.

#### Anticipation:

For a reference to anticipate an invention, all of the elements of that invention must be present in the reference. The test for anticipation under section 102 is whether each and every element as set forth in the claims is found, either expressly or inherently, in a single prior art reference. *Verdegaal Bros. V. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989), (Emphasis added). The elements must also be arranged as required by the claim. *In re Bond*, 15 USPQ2d 1566 (Fed. Cir. 1990).

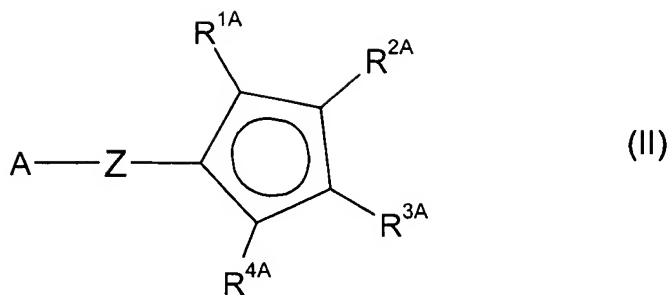
Applicant respectfully believes WO 01/92346 (referred to herein as Wang, et al.) fails to disclose, teach, or suggest, "A copolymer of ethylene with  $\alpha$ -olefins which comprises a molar mass distribution  $M_w/M_n$  of from 1 to 8, a density of from 0.85 to 0.94 g/cm<sup>3</sup>, a molar mass  $M_n$  of from 10,000 g/mol to 4,000,000 g/mol, a CDBI of less than

50%, a vinyl group content of from 0.1 to 1 vinyl groups/1000 carbon atoms, the copolymer comprising at least a bimodal short chain branching distribution, and wherein a side chain branching of the maxima of the individual peaks of the short chain branching distribution, as determined by crystallization analysis fractionation (CRYSTAF), of the copolymer of ethylene and the  $\alpha$ -olefins is greater than 5  $\text{CH}_3$ /1000 carbon atoms."

Additionally, Applicant believes Wang, et al. fails to disclose, teach, or suggest, "A process for preparing ethylene copolymers comprising a molar mass distribution  $M_w/M_n$  of from 1 to 8, a density of from 0.85 to 0.94  $\text{g/cm}^3$ , a molar mass  $M_n$  of from 10,000 g/mol to 4,000,000 g/mol, a CDBI of less than 50%, a vinyl group content of from 0.1 to 1 vinyl groups/1000 carbon atoms, the copolymer comprising at least a bimodal short chain branching distribution, and wherein a side chain branching of the maxima of the individual peaks of the short chain branching distribution, as determined by crystallization analysis fractionation (CRYSTAF), of the copolymer of ethylene and the  $\alpha$ -olefins is greater than 5  $\text{CH}_3$ /1000 carbon atoms, the process comprising polymerizing ethylene with  $\alpha$ -olefins in presence of the following components:

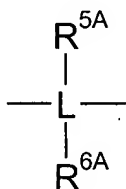
- A) at least one monocyclopentadienyl complex comprising a structural feature of a formula  $(\text{Cp-Z-A})\text{Cr} \text{ (I)}$ , where the variables have the following meanings:

$\text{Cp-Z-A}$  is a ligand of the formula (II):



where

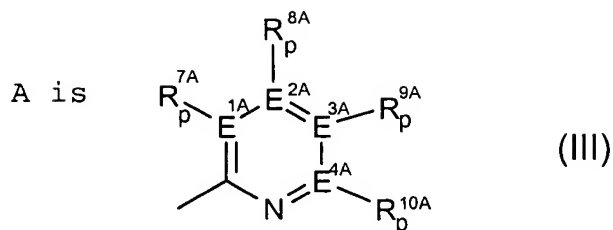
$R^{1A}$ - $R^{4A}$  are each, independently of one another, hydrogen,  $C_1$ - $C_{20}$ -alkyl,  $C_2$ - $C_{20}$ -alkenyl,  $C_6$ - $C_{20}$ -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part,  $NR^{11A}_2$ ,  $N(SiR^{11A}_3)_2$ ,  $OR^{11A}$ ,  $OSiR^{11A}_3$ ,  $SiR^{11A}_3$ ,  $BR^{11A}_2$ , where the organic radicals  $R^{1A}$ - $R^{4A}$  may also be substituted by halogens and where at least two of the vicinal radicals  $R^{1A}$ - $R^{4A}$  are joined to form a five- or six-membered ring, and/or two vicinal radicals  $R^{1A}$ - $R^{4A}$  are joined to form a heterocycle which contains at least one atom from the group consisting of N, P, O and S; Z is a bridge between A and Cp having the formula:



where

L is carbon or silicon,

$R^{5A}$ ,  $R^{6A}$  are each hydrogen,  $C_1$ - $C_{20}$ -alkyl,  $C_2$ - $C_{20}$ -alkenyl,  $C_6$ - $C_{20}$ -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or  $SiR^{11A}_3$ , where the organic radicals  $R^{5A}$  and  $R^{6A}$  may also be substituted by halogens and  $R^{5A}$  and  $R^{6A}$  may also be joined to form a five- or six-membered ring;



where

$E^{1A}-E^{4A}$  are each carbon or nitrogen,

$R^{7A}-R^{10A}$  are each, independently of one another, hydrogen,  $C_1-C_{20}$ -alkyl,  $C_2-C_{20}$ -alkenyl,  $C_6-C_{20}$ -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or  $SiR^{11A}_3$ , where the organic radicals  $R^{7A}-R^{10A}$  may also bear halogens or nitrogen or further  $C_1-C_{20}$ -alkyl groups,  $C_2-C_{20}$ -alkenyl groups,  $C_6-C_{20}$ -aryl groups, alkylaryl groups having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or  $SiR^{11A}_3$  as substituents and two vicinal radicals  $R^{7A}-R^{10A}$  or  $R^{7A}$  and Z may also be joined to form a five- or six-membered ring,

$R^{11A}$  are each, independently of one another, hydrogen,  $C_1-C_{20}$ -alkyl,  $C_2-C_{20}$ -alkenyl,  $C_6-C_{20}$ -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two geminal radicals  $R^{11A}$  may also be joined to form a five- or six-membered ring, and

p is 0 when  $E^{1A}-E^{4A}$  is nitrogen and is 1 when

$E^{1A}-E^{4A}$  is carbon;

B) optionally, an organic or inorganic support;

C) optionally, at least one activating compound; and

D) optionally, at least one metal compound containing a metal

of group 1, 2 or 13 of the Periodic Table."

In particular, Applicant believes Wang, et al. fails to disclose, teach, or suggest the currently claimed ethylene copolymers or the currently claimed process for producing the currently claimed ethylene copolymers. More particularly, Applicant believes Wang, et al. fails to disclose, teach, or suggest ethylene copolymers comprising a molar mass distribution  $M_w/M_n$  of from 1 to 8, a density of from 0.85 to 0.94 g/cm<sup>3</sup>, a molar mass  $M_n$  of from 10,000 g/mol to 4,000,000 g/mol, a CDBI of less than 50%, a vinyl group content of from 0.1 to 1 vinyl groups/1000 carbon atoms, the copolymer comprising at least a bimodal short chain branching distribution, and wherein a side chain branching of the maxima of the individual peaks of the short chain branching distribution, as determined by crystallization analysis fractionation (CRYSTAF), of the copolymer of ethylene and the  $\alpha$ -olefins is greater than 5 CH<sub>3</sub>/1 000 carbon atoms. See MPEP §2131.

In fact, the currently pending Office Action states on page 3, lines 8-10,

Clearly, the process of the prior art is essentially as that described in claims 20 and 29, and it follows that the products prepared by essentially the same process will exhibit essentially the same properties.

However, this is not the standard for anticipation. The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989), (Emphasis added). Accordingly, Applicant respectfully believes the current rejection should be

withdrawn for this reason alone.

Additionally, the currently pending Office Action states on page 3, lines 10-11,

Therefore, it is maintained that the copolymer prepared by Wang et al. inherently possesses the properties recited in claims 16-20.

However, to establish inherency, the extrinsic evidence "must make clear that the missing descriptive matter is necessarily present in the thing described in the reference. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient." *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999), (Emphasis added). See MPEP §2163.07(a).

Accordingly, given the previous concession by the Examiner, even if Wang, et al. disclosed "essentially the same process", which is denied by Applicant, Applicant respectfully believes the resultant polymers produced from the process of Wang, et al. would not necessarily comprise all of the claimed constituents of Applicant's currently claimed polyethylene copolymers.

As such, Applicant respectfully believes the current anticipation rejection should be withdrawn.

Obviousness:

The U.S. Supreme Court in *Graham v. John Deere Co.*, 148 U.S.P.Q. 459 (1966) held that non-obviousness was determined under § 103 by (1) determining the scope and content of the prior art; (2) ascertaining the differences between the prior art and the claims at issue; (3) resolving the level of ordinary skill in the art; and, (4) inquiring as to any objective evidence of non-obviousness.

To establish a *prima facie* case of obviousness, the Examiner must establish: (1) that some suggestion or motivation to modify the references exists; (2) a reasonable expectation of success; and (3) that the prior art references teach or suggest all the claim limitations. *Amgen, Inc. v. Chugai Pharm. Co.*, 18 USPQ2d 1016, 1023 (Fed. Cir. 1991); *In re Fine*, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988); *In re Wilson*, 165 USPQ 494, 496 (C.C.P.A. 1970).

Applicant respectfully believes Wang, et al. does not render obvious the currently pending claims.

In particular, in addition to the arguments *supra* regarding Wang, et al., which are incorporated herein by reference in their entirety, the Examiner is relying on the catalyst in Example 5 (i.e., 2-pyridylmethyl(Ind)CrCl<sub>2</sub>) in Wang, et al. which was used to polymerize ethylene homopolymers, the properties of which are disclosed in Table I and II on page 21.

However, as outlined in Applicant's response of October 6, 2006, the catalyst in Example 5 in Wang, et al. was used to produce ethylene homopolymers having a density of 0.955 g/cc and a MWD of

10.6, whereas Applicant is currently claiming, ethylene copolymers comprising a molar mass distribution  $M_w/M_n$  of from 1 to 8, and a density of from 0.85 to 0.94 g/cm<sup>3</sup>.

Additionally, the Examiner has not explained, first, why one would have explicitly chosen the specific catalyst selected by the Examiner from Wang, et al. in view of the fact that Wang, et al. discloses a myriad of other catalysts, and second, why one would have modified the process of Wang, et al. in conjunction with using the specific catalyst selected from Wang, et al. in an attempt to arrive at Applicant's currently claimed ethylene copolymers. However, this is the Examiner's initial burden in establishing a *prima facie* case of obviousness. See MPEP §2141.02 and §2142.

Accordingly, should the Examiner maintain the current rejection, notwithstanding the further arguments presented below, the Examiner is respectfully requested to explain why, with factual, objective evidence, one having ordinary skill in the art would have selected the currently cited catalyst from Wang, et al., and then modified the process of Wang, et al. using it.

In light of the above, claims 16-20, 28, and 29 are therefore believed to be patentable over Wang, et al. Accordingly, reconsideration and withdrawal of the rejection is requested.

**3. Rejection of Claims 16-18 and 27 Under 35 U.S.C.**

**§102(b)/103(a)**

The Office Action states that claims 16-18 and 27 are rejected under 35 U.S.C. 102(b) as being anticipated by, or in the alternative under 35 U.S.C. §103(a) as being obvious over Kale et al. (U.S. Patent 6,420,507). In particular, the Office Action states,

Kale et al. teaches a series of ethylene/1-octene copolymer exhibiting density of about 0.870 g/cm<sup>3</sup>,  $M_n$  on order of about 44,000-57,000, and  $M_w/M_n$  in the range of about 2.2-2.8 (see entries 1a-c and 2a-d in tables 2 and 5). Copolymers prepared from these catalysts also exhibit bimodal short chain branching distribution (col. 54, line 36). The reference is silent with regard to the CDBI and side chain branching per 1000 carbon atoms, however, light of the fact that the copolymer exhibits essentially the same properties and in view of the fact that the branching distribution is bimodal, a reasonable basis exists to believe that the claimed broad CDBI and side chain branching range is associated with bimodal distribution, and therefore, these properties are also exhibited by the polymers of Kale et al. Since the PTO can not conduct experiments, the burden of proof is shifted to the Applicants to establish an unobviousness difference. In re Fitzgerald, 619 F.2d 67, 205 USPQ 594 (CCPA 1980). See MPEP §2112-2112.02.

Preparation of blend is disclosed in Kale et al. (col. 6, line 50), and therefore, it would have been obvious to one having ordinary skill in the art to use the inventive polymer in blends.

**RESPONSE**

Applicant respectfully traverses the rejection of claims 16-18, and 27.

Anticipation:

For a reference to anticipate an invention, all of the elements of that invention must be present in the reference. The test for anticipation under section 102 is whether each and every element as set forth in the claims is found, either expressly or inherently, in a single prior art reference. *Verdegaal Bros. V. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989), (Emphasis added). The elements must also be arranged as required by the claim. *In re Bond*, 15 USPQ2d 1566 (Fed. Cir. 1990).

Applicant respectfully believes U.S. Patent 6,420,507 (referred to herein as Kale, et al.) fails to disclose, teach, or suggest, "A copolymer of ethylene with  $\alpha$ -olefins which comprises a molar mass distribution  $M_w/M_n$  of from 1 to 8, a density of from 0.85 to 0.94 g/cm<sup>3</sup>, a molar mass  $M_n$  of from 10,000 g/mol to 4,000,000 g/mol, a CDBI of less than 50%, a vinyl group content of from 0.1 to 1 vinyl groups/1000 carbon atoms, the copolymer comprising at least a bimodal short chain branching distribution, and wherein a side chain branching of the maxima of the individual peaks of the short chain branching distribution, as determined by crystallization analysis fractionation (CRYSTAF), of the copolymer of ethylene and the  $\alpha$ -olefins is greater than 5 CH<sub>3</sub>/1000 carbon atoms."

In particular, Applicant believes Kale, et al. fails to disclose, teach, or suggest the currently claimed ethylene copolymers. More particularly, Applicant believes Kale, et al.

fails to disclose, teach, or suggest ethylene copolymers comprising a molar mass distribution  $M_w/M_n$  of from 1 to 8, a density of from 0.85 to 0.94 g/cm<sup>3</sup>, a molar mass  $M_n$  of from 10,000 g/mol to 4,000,000 g/mol, a CDBI of less than 50%, a vinyl group content of from 0.1 to 1 vinyl groups/1000 carbon atoms, the copolymer comprising at least a bimodal short chain branching distribution, and wherein a side chain branching of the maxima of the individual peaks of the short chain branching distribution, as determined by crystallization analysis fractionation (CRYSTAF), of the copolymer of ethylene and the  $\alpha$ -olefins is greater than 5 CH<sub>3</sub>/1 000 carbon atoms. See MPEP §2131.

Applicant is aware Kale, et al. discloses in col. 40, lines 40-42,

The polymers of the present invention will preferably have at least 0.03, more preferably at least 0.04 vinyls/1000 carbons, as determined by FTIR.

However, Applicant respectfully believes this open-ended, generic disclosure within Kale, et al. does not anticipate, or as discussed below, render obvious Applicant's currently claimed ethylene copolymers. In order to anticipate the claims, the claimed subject matter must be disclosed in the reference with sufficient specificity to constitute an anticipation under the statute. See MPEP §2131.03, section II. Additionally, the identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir.

1989).

Moreover, Applicant is aware Kale, et al. discloses in col. 63, Table Nine, comparative example 3b, which is indicated as having a vinyls content of 0.130. However, Applicant respectfully believes comparative example 3b is a monomodal polymer, and not bimodal as currently claimed by Applicant.

As such, Applicant respectfully believes the current anticipation rejection should be withdrawn.

Obviousness:

The U.S. Supreme Court in *Graham v. John Deere Co.*, 148 U.S.P.Q. 459 (1966) held that non-obviousness was determined under § 103 by (1) determining the scope and content of the prior art; (2) ascertaining the differences between the prior art and the claims at issue; (3) resolving the level of ordinary skill in the art; and, (4) inquiring as to any objective evidence of non-obviousness.

To establish a *prima facie* case of obviousness, the Examiner must establish: (1) that some suggestion or motivation to modify the references exists; (2) a reasonable expectation of success; and (3) that the prior art references teach or suggest all the claim limitations. Amgen, Inc. v. Chugai Pharm. Co., 18 USPQ2d 1016, 1023 (Fed. Cir. 1991); In re Fine, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988); In re Wilson, 165 USPQ 494, 496 (C.C.P.A. 1970).

Arguments regarding Kale, et al. *supra* are incorporated herein by reference in their entirety. Accordingly, Applicant respectfully

believes Kale, et al. does not render obvious the currently pending claims.

In particular, as outlined above, Applicant believes Kale, et al. does not teach, disclose, or suggest Applicant's current claimed ethylene copolymers comprising a molar mass distribution  $M_w/M_n$  of from 1 to 8, a density of from 0.85 to 0.94 g/cm<sup>3</sup>, a molar mass  $M_n$  of from 10,000 g/mol to 4,000,000 g/mol, a CDBI of less than 50%, a vinyl group content of from 0.1 to 1 vinyl groups/1000 carbon atoms, the copolymer comprising at least a bimodal short chain branching distribution, and wherein a side chain branching of the maxima of the individual peaks of the short chain branching distribution, as determined by crystallization analysis fractionation (CRYSTAF), of the copolymer of ethylene and the  $\alpha$ -olefins is greater than 5 CH<sub>3</sub>/1 000 carbon atoms.

To establish a *prima facie* case of obviousness, three criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference must teach or suggest all the claim limitations. See MPEP §2142.

Accordingly, as outlined *supra*, since Kale, et al. does not disclose, teach, or suggest Applicant's currently claimed ethylene copolymers, and there is no suggestion or motivation to modify Kale,

et al., nor would there be any expectation of success in modifying Kale, et al., Applicant respectfully believes the currently pending claims are unobvious in view of Kale, et al.

As such, Applicant respectfully believes the current obviousness rejection should be withdrawn.

In light of the above, claims 16-18, and 27 are therefore believed to be patentable over Kale, et al. Accordingly, reconsideration and withdrawal of the rejection is requested.

#### **4. Rejection of Claims 16-19 Under 35 U.S.C. §102(b)/103(a)**

The Office Action states that claims 16-19 are rejected under 35 U.S.C. 102(b) as being anticipated by, or in the alternative under 35 U.S.C. §103(a) as being obvious over Jejelowo (U.S. Patent 5,281,679). In particular, the Office Action states,

Jejelowo et al. discloses polymer H, prepared by chromium based catalyst, exhibiting a density of 0.920 g/cm<sup>3</sup>,  $M_n$  of 14,000,  $M_w/M_n$  of 7.1, and CDBI of 25.9%. The reference is silent with respect to the modality of the branching distribution and side chain branching per 1000 carbon atoms. It is noted that the polymer contains a significant hexanes extractables fraction, indicating the presence of low molecular weight components and components with high frequency of short chain branching (regardless of molecular weight); see col. 16, lines 36-40. In view of the low CDBI, which reflects non-uniform branching distribution, the presence of hexanes extractables, and in light of the fact that the polymer is prepared by a chromium catalyst and exhibits the claimed density and molecular weight features, a reasonable basis exists to believe that the polymer in Jejelowo et al. exhibits the other properties recited in the instant claims. Since the PTO can not conduct experiments, the burden of proof is shifted to the Applicants to establish an unobviousness difference. In re Fitzgerald, 619 F.2d. 67, 205 USPQ 594 (CCPA 1980).

See MPEP § 2112-2112.02.

### RESPONSE

Applicant respectfully traverses the rejection of claims 16-19.

#### Anticipation:

For a reference to anticipate an invention, all of the elements of that invention must be present in the reference. The test for anticipation under section 102 is whether each and every element as set forth in the claims is found, either expressly or inherently, in a single prior art reference. *Verdegaal Bros. V. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989), (Emphasis added). The elements must also be arranged as required by the claim. *In re Bond*, 15 USPQ2d 1566 (Fed. Cir. 1990).

Applicant respectfully believes U.S. Patent 5,281,679 (referred to herein as Jejelowo, et al.) fails to disclose, teach, or suggest, "A copolymer of ethylene with  $\alpha$ -olefins which comprises a molar mass distribution  $M_w/M_n$  of from 1 to 8, a density of from 0.85 to 0.94 g/cm<sup>3</sup>, a molar mass  $M_n$  of from 10,000 g/mol to 4,000,000 g/mol, a CDBI of less than 50%, a vinyl group content of from 0.1 to 1 vinyl groups/1000 carbon atoms, the copolymer comprising at least a bimodal short chain branching distribution, and wherein a side chain branching of the maxima of the individual peaks of the short chain

branching distribution, as determined by crystallization analysis fractionation (CRYSTAF), of the copolymer of ethylene and the  $\alpha$ -olefins is greater than 5 CH<sub>3</sub>/1000 carbon atoms."

In particular, Applicant believes Jejelowo, et al. fails to disclose, teach, or suggest the currently claimed ethylene copolymers comprising a molar mass distribution  $M_w/M_n$  of from 1 to 8, a density of from 0.85 to 0.94 g/cm<sup>3</sup>, a molar mass  $M_n$  of from 10,000 g/mol to 4,000,000 g/mol, a CDBI of less than 50%, a vinyl group content of from 0.1 to 1 vinyl groups/1000 carbon atoms, the copolymer comprising at least a bimodal short chain branching distribution, and wherein a side chain branching of the maxima of the individual peaks of the short chain branching distribution, as determined by crystallization analysis fractionation (CRYSTAF), of the copolymer of ethylene and the  $\alpha$ -olefins is greater than 5 CH<sub>3</sub>/1 000 carbon atoms. See MPEP §2131.

In fact, the Examiner acknowledges on page 4, lines 6-8,

The reference is silent with respect to the modality of the branching distribution and side chain branching per 1000 carbon atoms.

However, Applicant is currently claiming an ethylene copolymer comprising a bimodal short chain branching distribution wherein a side chain branching of the maxima of the individual peaks of the short chain branching distribution, as determined by crystallization analysis fractionation (CRYSTAF), of the copolymer of ethylene and the  $\alpha$ -olefins is greater than 5 CH<sub>3</sub>/1000 carbon atoms.

The Examiner tries to overcome this deficiency in the Office Action by stating,

It is noted that the polymer contains a significant hexanes extractables fraction, indicating the presence of low molecular weight components and components with high frequency of short chain branching (regardless of molecular weight); see col. 16, lines 36-40. In view of the low CDBI, which reflects non-uniform branching distribution, the presence of hexanes extractables, and in light of the fact that the polymer is prepared by a chromium catalyst and exhibits the claimed density and molecular weight features, a reasonable basis exists to believe that the polymer in Jejelowo et al. exhibits the other properties recited in the instant claims.

However, to establish inherency, the extrinsic evidence "must make clear that the missing descriptive matter is necessarily present in the thing described in the reference. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient." *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999), (Emphasis added). See MPEP §2163.07(a).

Additionally, Applicant respectfully believes Jejelowo, et al. does not disclose, teach, or suggest Applicant's currently claimed ethylene copolymers comprising a vinyl group content of from 0.1 to 1 vinyl groups/1000 carbon atoms.

As such, Applicant respectfully believes the current anticipation rejection should be withdrawn.

Obviousness:

The U.S. Supreme Court in *Graham v. John Deere Co.*, 148 U.S.P.Q. 459 (1966) held that non-obviousness was determined under § 103 by (1) determining the scope and content of the prior art; (2) ascertaining the differences between the prior art and the claims at issue; (3) resolving the level of ordinary skill in the art; and, (4) inquiring as to any objective evidence of non-obviousness.

To establish a *prima facie* case of obviousness, the Examiner must establish: (1) that some suggestion or motivation to modify the references exists; (2) a reasonable expectation of success; and (3) that the prior art references teach or suggest all the claim limitations. *Amgen, Inc. v. Chugai Pharm. Co.*, 18 USPQ2d 1016, 1023 (Fed. Cir. 1991); *In re Fine*, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988); *In re Wilson*, 165 USPQ 494, 496 (C.C.P.A. 1970).

Arguments regarding Jejelowo, et al. *supra* are incorporated herein by reference in their entirety. Accordingly, Applicant respectfully believes Jejelowo, et al. does not render obvious the currently pending claims.

In particular, as outlined above, Applicant believes Jejelowo, et al. does not teach, disclose, or suggest Applicant's current claimed ethylene copolymers comprising a molar mass distribution  $M_w/M_n$  of from 1 to 8, a density of from 0.85 to 0.94 g/cm<sup>3</sup>, a molar mass  $M_n$  of from 10,000 g/mol to 4,000,000 g/mol, a CDBI of less than 50%, a vinyl group content of from 0.1 to 1 vinyl groups/1000 carbon atoms, the copolymer comprising at least a bimodal short chain

branching distribution, and wherein a side chain branching of the maxima of the individual peaks of the short chain branching distribution, as determined by crystallization analysis fractionation (CRYSTAF), of the copolymer of ethylene and the  $\alpha$ -olefins is greater than 5 CH<sub>3</sub>/1 000 carbon atoms.

To establish a *prima facie* case of obviousness, three criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference must teach or suggest all the claim limitations. See MPEP §2142.

Accordingly, as outlined *supra*, since Jejelowo, et al. does not disclose, teach, or suggest Applicant's currently claimed ethylene copolymers, and there is no suggestion or motivation to modify Jejelowo, et al., nor would there be any expectation of success in modifying Jejelowo, et al., Applicant respectfully believes the currently pending claims are unobvious in view of Jejelowo, et al.

As such, Applicant respectfully believes the current obviousness rejection should be withdrawn.

In light of the above, claims 16-19 are therefore believed to be patentable over Jejelowo, et al. Accordingly, reconsideration and withdrawal of the rejection is requested.

**5. Rejection of Claims 16-19, 21, 22, 24-26, and 28 Under 35****U.S.C. §103(a)**

The Office Action states that claims 16-19, 21, 22, 24-26, and 28 are rejected under 35 U.S.C. §103(a) as being obvious over Mihan, et al. (WO 01/12641). In particular, the Office Action states,

Mihan et al. teaches a general catalyst system comprising (un)substituted monocyclopentadienyl chromium (III) complexes. The transition metal component has structure defined by structural components (I) and (II), as shown on page 6. One notes that the  $\eta$ -ligand has bridging group B and pendant moiety Z. The bridging group is of formula  $L^2(R^{13})(R^{14})$  where  $L^2$  is carbon or silicon. Z is a heterocyclic moiety, and page 8 shows that this is a 2-pyridyl or 8-quinolyl group, and substituted derivatives thereof are preferred (page 8, line 45-47). Surprisingly, the examples of Mihan et al. do not show a single organometallic complex containing the requisite bridging group  $L^2(R^{13})(R^{14})$ , as disclosed in the body of the patent. There is disclosed the complexes (8-quinolynyl)(Ind)CrCl<sub>2</sub> and (2-Me-8-quinolynyl)(Me<sub>4</sub>C<sub>5</sub>)CrCl<sub>2</sub>, in examples 8 and 10, where the quinolynyl moiety is bound directly to the Cp ligand, but no bridging group exists in either complex (see experimental and supporting <sup>1</sup>H NMR data). Despite this, one of ordinary skill in the art would have found it obvious to follow the teachings of the disclosure and claims and make the corresponding bridged derivatives of these compounds because this is the actual scope of the disclosure of the patent. Thus, one of ordinary skill in the art would have found it obvious to make  $[L^2(R^{13})(R^{14})](8\text{-quinolynyl})(\text{Ind})\text{CrCl}_2$  and  $[L^2(R^{13})(R^{14})](2\text{-Me-8-quinolynyl})(\text{Cp})\text{CrCl}_2$  and thereby arrive at the catalyst of the instant claims, and since the patent teaches use of catalysts in a process of polymerizing olefins, the skilled artisan also would have found it obvious to do likewise with the catalyst comprising the bridged derivative. One of ordinary skill in the art also would have found it obvious to arrive at the claimed process using a substituted 2-pyridyl analogue because Mihan et al. teaches such an embodiment (see page 8, structure in line 5, and discussion lines 45 - 47). Obviously, Mihan et al. does not show a polymer product derived from the catalysts claimed in the text, however, a reasonable basis exists to believe that the product would exhibit the properties

recited in the instant claims because the catalyst disclosed by Mihan et al. and the polymerization process using the catalyst is essentially the same as that recited in the instant claims. Since the PTO can not perform experiments, the burden is shifted to the Applicants to establish an unobviousness difference. In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977). In re Spada, 911 F.2d 705, 709, 15 USPQ2d 1655, 1658 (Fed. Cir. 1990).

### RESPONSE

Claim 25 has been cancelled rendering the above rejection moot.

Applicant respectfully traverses the rejection of claims 16-19, 21, 22, 24, 26, and 28.

The U.S. Supreme Court in *Graham v. John Deere Co.*, 148 U.S.P.Q. 459 (1966) held that non-obviousness was determined under § 103 by (1) determining the scope and content of the prior art; (2) ascertaining the differences between the prior art and the claims at issue; (3) resolving the level of ordinary skill in the art; and, (4) inquiring as to any objective evidence of non-obviousness.

To establish a *prima facie* case of obviousness, the Examiner must establish: (1) that some suggestion or motivation to modify the references exists; (2) a reasonable expectation of success; and (3) that the prior art references teach or suggest all the claim limitations. Amgen, Inc. v. Chugai Pharm. Co., 18 USPQ2d 1016, 1023 (Fed. Cir. 1991); In re Fine, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988); In re Wilson, 165 USPQ 494, 496 (C.C.P.A. 1970).

Applicant respectfully believes Mihan, et al. does not disclose, teach, or suggest, "A copolymer of ethylene with  $\alpha$ -olefins

which comprises a molar mass distribution  $M_w/M_n$  of from 1 to 8, a density of from 0.85 to 0.94 g/cm<sup>3</sup>, a molar mass  $M_n$  of from 10,000 g/mol to 4,000,000 g/mol, a CDBI of less than 50%, a vinyl group content of from 0.1 to 1 vinyl groups/1000 carbon atoms, the copolymer comprising at least a bimodal short chain branching distribution, and wherein a side chain branching of the maxima of the individual peaks of the short chain branching distribution, as determined by crystallization analysis fractionation (CRYSTAF), of the copolymer of ethylene and the  $\alpha$ -olefins is greater than 5 CH<sub>3</sub>/1000 carbon atoms."

In particular, Applicant believes Mihan, et al. does not teach, disclose, or suggest Applicant's current claimed ethylene copolymers comprising a molar mass distribution  $M_w/M_n$  of from 1 to 8, a density of from 0.85 to 0.94 g/cm<sup>3</sup>, a molar mass  $M_n$  of from 10,000 g/mol to 4,000,000 g/mol, a CDBI of less than 50%, a vinyl group content of from 0.1 to 1 vinyl groups/1000 carbon atoms, the copolymer comprising at least a bimodal short chain branching distribution, and wherein a side chain branching of the maxima of the individual peaks of the short chain branching distribution, as determined by crystallization analysis fractionation (CRYSTAF), of the copolymer of ethylene and the  $\alpha$ -olefins is greater than 5 CH<sub>3</sub>/1 000 carbon atoms.

To establish a *prima facie* case of obviousness, three criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally

available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference must teach or suggest all the claim limitations. See MPEP §2142.

In fact, the Office Action acknowledges on page 5, lines 13-17,

Mihan et al. does not show a polymer product derived from the catalysts claimed in the text, however, a reasonable basis exists to believe that the product would exhibit the properties recited in the instant claims because the catalyst disclosed by Mihan et al. and the polymerization process using the catalyst is essentially the same as that recited in the instant claims.

However, to establish inherency, the extrinsic evidence "must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient." *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999), (Emphasis added). See MPEP §2163.07(a).

Accordingly, since Mihan, et al. does not disclose, teach, or suggest Applicant's currently claimed ethylene copolymers, and there is no suggestion or motivation to modify Mihan, et al., nor would there be any expectation of success in modifying Mihan, et al., Applicant respectfully believes the currently pending claims are

unobvious in view of Mihan, et al. As such, Applicant respectfully believes the current obviousness rejection should be withdrawn.

In light of the above, claims 16-19, 21, 22, 24, 26, and 28 are therefore believed to be patentable over Mihan, et al. Accordingly, reconsideration and withdrawal of the rejection is requested.

**6. Rejection of Claim 23 Under 35 U.S.C. §103(a)**

The Office Action states that claim 23 is rejected under 35 U.S.C. §103(a) as being obvious over Wang, et al. (WO 01/92346, the U.S. equivalent being U.S. Patent 6,723,675) in view of Welch, et al. (U.S. Patent 5,498,581). In particular, the Office Action states,

Wang contemplates that inventive catalysts may be in the form of prepolymer (page 10, lines 22-29), but there is not teaching as to how this type of catalyst is made. Welch et al. teaches that 5-80 wt % of prepolymer relative to the mass of resulting prepolymerized solid catalyst system is a practical working range for transition metal catalyzed olefin polymerizations. It would have been obvious to one having ordinary skill in the art to use the amount taught by Welch et al. in making the prepolymer disclosed in Wang because this has been shown to produce useful catalysts, and consequently, the skilled artisan would have expected such an embodiment to work. The combination is obvious since both patents relate to olefin polymerization process.

**RESPONSE**

Applicant respectfully traverses the rejection of claim 23.

The U.S. Supreme Court in *Graham v. John Deere Co.*, 148 U.S.P.Q. 459 (1966) held that non-obviousness was determined under § 103 by (1) determining the scope and content of the prior art; (2)

ascertaining the differences between the prior art and the claims at issue; (3) resolving the level of ordinary skill in the art; and, (4) inquiring as to any objective evidence of non-obviousness.

To establish a *prima facie* case of obviousness, the Examiner must establish: (1) that some suggestion or motivation to modify the references exists; (2) a reasonable expectation of success; and (3) that the prior art references teach or suggest all the claim limitations. Amgen, Inc. v. Chugai Pharm. Co., 18 USPQ2d 1016, 1023 (Fed. Cir. 1991); In re Fine, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988); In re Wilson, 165 USPQ 494, 496 (C.C.P.A. 1970).

Arguments regarding Wang, et al. *supra* are incorporated herein by reference in their entirety. Additionally, Applicant respectfully believes Welch, et al. does not remedy the deficiencies of Wang, et al.

As discussed *supra*, Applicant respectfully believes Wang, et al. fails to disclose, teach, or suggest, "A copolymer of ethylene with  $\alpha$ -olefins which comprises a molar mass distribution  $M_w/M_n$  of from 1 to 8, a density of from 0.85 to 0.94 g/cm<sup>3</sup>, a molar mass  $M_n$  of from 10,000 g/mol to 4,000,000 g/mol, a CDBI of less than 50%, a vinyl group content of from 0.1 to 1 vinyl groups/1000 carbon atoms, the copolymer comprising at least a bimodal short chain branching distribution, and wherein a side chain branching of the maxima of the individual peaks of the short chain branching distribution, as determined by crystallization analysis fractionation (CRYSTAF), of the copolymer of ethylene and the  $\alpha$ -olefins is greater than

5 CH<sub>3</sub>/1000 carbon atoms."

Additionally, Applicant respectfully believes Welch, et al. fails to remedy this deficiency in Wang, et al.

To establish a *prima facie* case of obviousness, three criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference must teach or suggest all the claim limitations. See MPEP §2142.

Accordingly, Applicant respectfully believes since Wang, et al. in view of Welch, et al. do not together or separately disclose Applicant's currently claim ethylene copolymers, let alone Applicant's currently claimed prepolymerized catalyst system for producing Applicant's currently claimed ethylene copolymers, the current rejection should be withdrawn.

In light of the above, claim 23 is therefore believed to be patentable over Wang, et al. in view of Welch, et al. Accordingly, reconsideration and withdrawal of the rejection is requested.

CONCLUSION

Based upon the above remarks, the presently claimed subject matter is believed to be novel and patentably distinguishable over the references of record. The Examiner is therefore respectfully requested to reconsider and withdraw all rejections and allow all pending claims 16-24 and 26-29. Favorable action with an early allowance of the claims pending in this application is earnestly solicited.

The Examiner is welcomed to telephone the undersigned practitioner with any questions or comments.

Respectfully submitted,

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RCE I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Mail Stop Amendment, Commissioner for Patents, P. O. Box 1450, Alexandria, VA 22313-1450 on

July 19 2007  
James A. Butler  
Signature  
July 19 2007  
Date

ATTACHMENT A



Claims 1 - 15: (Cancelled)

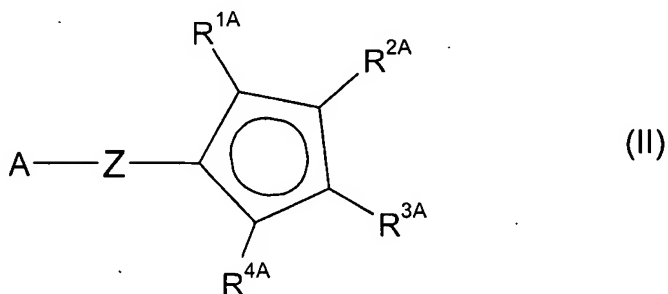
16. (Currently Amended) A copolymer of ethylene with  $\alpha$ -olefins which comprises a molar mass distribution  $M_w/M_n$  of from 1 to 8, a density of from 0.85 to 0.94 g/cm<sup>3</sup>, a molar mass  $M_n$  of from 10,000 g/mol to 4,000,000 g/mol, a CDBI of less than 50%, a vinyl group content of from 0.1 to 1 vinyl groups/1000 carbon atoms, the copolymer comprising at least a bimodal short chain branching distribution, and wherein a side chain branching of the maxima of the individual peaks of the short chain branching distribution, as determined by crystallization analysis fractionation (CRYSTAF), of the copolymer of ethylene and the  $\alpha$ -olefins is greater than 5 CH<sub>3</sub>/1000 carbon atoms.
17. (Currently Amended) The copolymer of ethylene with  $\alpha$ -olefins as claimed in claim 16, wherein the molar mass  $M_n$  is from 150,000 g/mol to 1,000,000 g/mol.
18. (Previously Presented) The copolymer of ethylene with  $\alpha$ -olefins as claimed in claim 16 which has at least one peak, as determined by CRYSTAF, of a differential distribution in the range from 15 to 40°C, and at least one further peak, as determined by CRYSTAF, of the differential distribution in the range from 25 to 80°C.
19. (Previously Presented) The copolymer of ethylene with  $\alpha$ -olefins as claimed in claim 16, wherein the copolymer

of ethylene with  $\alpha$ -olefins comprise a trimodal short chain branching distribution.

20. (Currently Amended) A process for preparing ethylene copolymers comprising a molar mass distribution  $M_w/M_n$  of from 1 to 8, a density of from 0.85 to 0.94 g/cm<sup>3</sup>, a molar mass  $M_n$  of from 10,000 g/mol to 4,000,000 g/mol, a CDBI of less than 50%, a vinyl group content of from 0.1 to 1 vinyl groups/1000 carbon atoms, the copolymer comprising at least a bimodal short chain branching distribution, and wherein a side chain branching of the maxima of the individual peaks of the short chain branching distribution, as determined by crystallization analysis fractionation (CRYSTAF), of the copolymer of ethylene and the  $\alpha$ -olefins is greater than 5 CH<sub>3</sub>/1000 carbon atoms, the process comprising polymerizing ethylene with  $\alpha$ -olefins in presence of the following components:

- A) at least one monocyclopentadienyl complex comprising a structural feature of a formula (Cp-Z-A)Cr (I), where the variables have the following meanings:

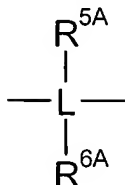
Cp-Z-A is a ligand of the formula (II):



where

$R^{1A}-R^{4A}$  are each, independently of one another, hydrogen,  $C_1-C_{20}$ -alkyl,  $C_2-C_{20}$ -alkenyl,  $C_6-C_{20}$ -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part,  $NR^{11A}_2$ ,  $N(SiR^{11A}_3)_2$ ,  $OR^{11A}$ ,  $OSiR^{11A}_3$ ,  $SiR^{11A}_3$ ,  $BR^{11A}_2$ , where the organic radicals  $R^{1A}-R^{4A}$  may also be substituted by halogens and where at least two of the vicinal radicals  $R^{1A}-R^{4A}$  are joined to form a five- or six-membered ring, and/or two vicinal radicals  $R^{1A}-R^{4A}$  are joined to form a heterocycle which contains at least one atom from the group consisting of N, P, O and S;

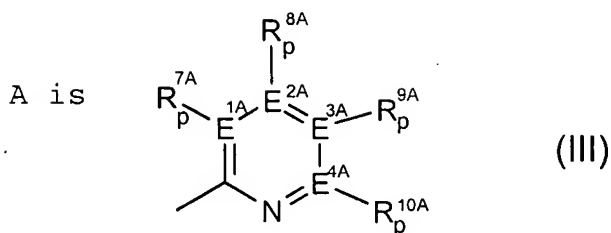
Z is a bridge between A and Cp having the formula:



where

L is carbon or silicon,

$R^{5A}, R^{6A}$  are each hydrogen,  $C_1-C_{20}$ -alkyl,  $C_2-C_{20}$ -alkenyl,  $C_6-C_{20}$ -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or  $SiR^{11A}_3$ , where the organic radicals  $R^{5A}$  and  $R^{6A}$  may also be substituted by halogens and  $R^{5A}$  and  $R^{6A}$  may also be joined to form a five- or six-membered ring;



where

$E^{1A}-E^{4A}$  are each carbon or nitrogen,

$R^{7A}-R^{10A}$  are each, independently of one another, hydrogen,  $C_1-C_{20}$ -alkyl,  $C_2-C_{20}$ -alkenyl,  $C_6-C_{20}$ -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or  $SiR^{11A}_3$ , where the organic radicals  $R^{7A}-R^{10A}$  may also bear halogens or nitrogen or further  $C_1-C_{20}$ -alkyl groups,  $C_2-C_{20}$ -alkenyl groups,  $C_6-C_{20}$ -aryl groups, alkylaryl groups having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or  $SiR^{11A}_3$  as substituents and two vicinal radicals  $R^{7A}-R^{10A}$  or  $R^{7A}$  and Z may also be joined to form a five- or six-membered ring,

$R^{11A}$  are each, independently of one another, hydrogen,  $C_1-C_{20}$ -alkyl,  $C_2-C_{20}$ -alkenyl,  $C_6-C_{20}$ -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two geminal radicals  $R^{11A}$  may also be joined to form a five- or six-membered ring, and

p is 0 when  $E^{1A}-E^{4A}$  is nitrogen and is 1 when  $E^{1A}-E^{4A}$  is carbon;

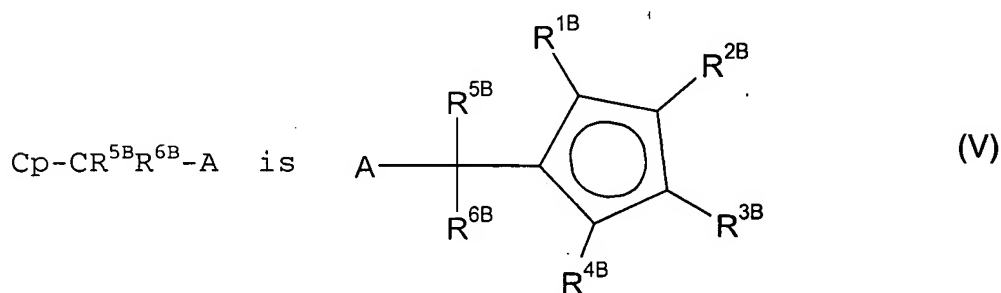
B) optionally, an organic or inorganic support;

C) optionally, at least one activating compound; and

D) optionally, at least one metal compound containing a metal of group 1, 2 or 13 of the Periodic Table.

21. (Currently Amended) A catalyst system for olefin polymerization comprising

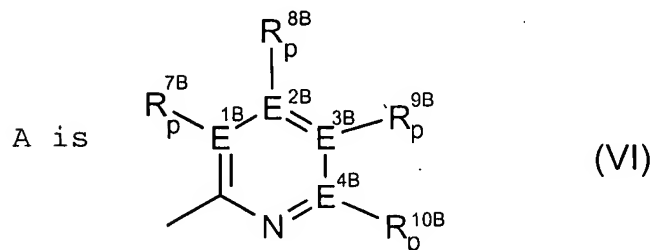
A') at least one monocyclopentadienyl complex A') comprising the structural feature of a formula (Cp-CR<sup>5B</sup>R<sup>6B</sup>-A)Cr (IV), where the variables have the following meanings:



where

R<sup>1B</sup>-R<sup>4B</sup> are each, independently of one another, hydrogen, C<sub>1</sub>-C<sub>20</sub>-alkyl, C<sub>2</sub>-C<sub>20</sub>-alkenyl, C<sub>6</sub>-C<sub>20</sub>-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl radical and 6-20 carbon atoms in the aryl radical, NR<sup>5A</sup><sub>2</sub>, N(SiR<sup>11B</sup><sub>3</sub>)<sub>2</sub>, OR<sup>11B</sup>, OSiR<sup>11B</sup><sub>3</sub>, SiR<sup>11B</sup><sub>3</sub>, BR<sup>11B</sup><sub>2</sub>, where the organic radicals R<sup>1B</sup>-R<sup>4B</sup> may also be substituted by halogens and two vicinal radicals R<sup>1B</sup>-R<sup>4B</sup> may also be joined to form a five- or six-membered ring,

R<sup>5B</sup>, R<sup>6B</sup> are each hydrogen or methyl;



where

$E^{1B}-E^{4B}$  are each carbon or nitrogen,

$R^{7B}-R^{10B}$  are each, independently of one another, hydrogen,  $C_1-C_{20}$ -alkyl,  $C_2-C_{20}$ -alkenyl,  $C_6-C_{20}$ -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or  $SiR^{11B}_3$ , where the organic radicals  $R^{7B}-R^{10B}$  may also bear halogens or nitrogen or further  $C_1-C_{20}$ -alkyl groups,  $C_2-C_{20}$ -alkenyl groups,  $C_6-C_{20}$ -aryl groups, alkylaryl groups having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or  $SiR^{11B}_3$ , as substituents and two vicinal radicals  $R^{7B}-R^{10B}$  may also be joined to form a five- or six-membered ring,

$R^{11B}$  are each, independently of one another, hydrogen,  $C_1-C_{20}$ -alkyl,  $C_2-C_{20}$ -alkenyl,  $C_6-C_{20}$ -aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals  $R^{11B}$  may also be joined to form a five- or six-membered ring,

$p$  is 0 when  $E^{1B}-E^{4B}$  is nitrogen and is 1 when  $E^{1B}-E^{4B}$  is carbon,

where at least one radical  $R^{7B}-R^{10B}$  is  $C_1-C_{20}$ -alkyl,  $C_2-C_{20}$ -alkenyl,  $C_6-C_{20}$ -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or  $SiR^{11B}_3$ , and the organic radicals  $R^{7B}-R^{10B}$  may also bear halogens or nitrogen

or further C<sub>1</sub>-C<sub>20</sub>-alkyl groups, C<sub>2</sub>-C<sub>20</sub>-alkenyl groups, C<sub>6</sub>-C<sub>20</sub>-aryl groups, alkylaryl groups having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or SiR<sup>5C</sup><sub>3</sub> as substituents and two vicinal radicals R<sup>7B</sup>-R<sup>10B</sup> may also be joined to form a five- or six-membered ring or at least one E<sup>1B</sup>-E<sup>4B</sup> is nitrogen;

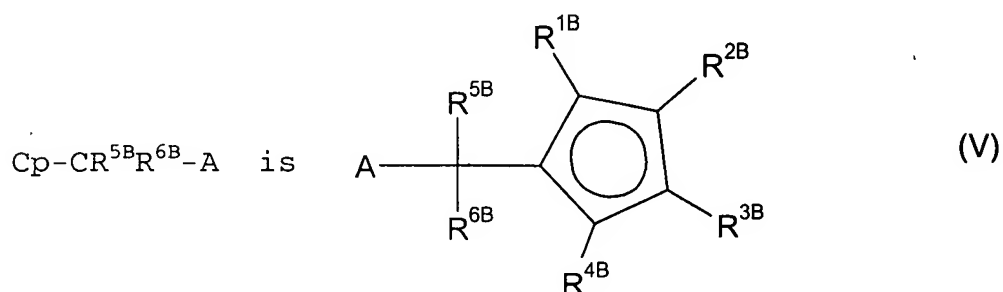
- B) optionally, an organic or inorganic support;
- C) optionally, at least one activating compound; and
- D) optionally, at least one metal compound containing a metal of group 1, 2 or 13 of the Periodic Table,

wherein the catalyst system produces a copolymer of ethylene with  $\alpha$ -olefins which comprises a molar mass distribution  $M_w/M_n$  of from 1 to 8, a density of from 0.85 to 0.94 g/cm<sup>3</sup>, a molar mass  $M_n$  of from 10,000 g/mol to 4,000,000 g/mol, a CDBI of less than 50%, a vinyl group content of from 0.1 to 1 vinyl groups/1000 carbon atoms, the copolymer comprising at least a bimodal short chain branching distribution, and wherein a side chain branching of the maxima of the individual peaks of the short chain branching distribution, as determined by crystallization analysis fractionation (CRYSTAF), of the copolymer of ethylene and the  $\alpha$ -olefins is greater than 5 CH<sub>3</sub>/1000 carbon atoms.

22. (Previously Presented) The catalyst system for olefin polymerization as claimed in claim 21, wherein two vicinal radicals R<sup>1B</sup>-R<sup>4B</sup> in the monocyclopentadienyl complex A') form a fused ring system.

23. (Currently Amended) A prepolymerized catalyst system comprising a catalyst system comprising:

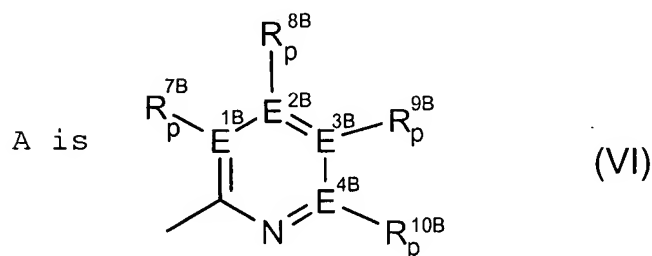
A') at least one monocyclopentadienyl complex A') comprising the structural feature of a formula (Cp-CR<sup>5B</sup>R<sup>6B</sup>-A)Cr (IV), where the variables have the following meanings:



where

R<sup>1B</sup>-R<sup>4B</sup> are each, independently of one another, hydrogen, C<sub>1</sub>-C<sub>20</sub>-alkyl, C<sub>2</sub>-C<sub>20</sub>-alkenyl, C<sub>6</sub>-C<sub>20</sub>-aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl radical and 6-20 carbon atoms in the aryl radical, NR<sup>5A</sup><sub>2</sub>, N(SiR<sup>11B</sup><sub>3</sub>)<sub>2</sub>, OR<sup>11B</sup>, OSiR<sup>11B</sup><sub>3</sub>, SiR<sup>11B</sup><sub>3</sub>, BR<sup>11B</sup><sub>2</sub>, where the organic radicals R<sup>1B</sup>-R<sup>4B</sup> may also be substituted by halogens and two vicinal radicals R<sup>1B</sup>-R<sup>4B</sup> may also be joined to form a five- or six-membered ring,

R<sup>5B</sup>, R<sup>6B</sup> are each hydrogen or methyl;



where

E<sup>1B</sup>-E<sup>4B</sup> are each carbon or nitrogen,

R<sup>7B</sup>-R<sup>10B</sup> are each, independently of one another, hydrogen, C<sub>1</sub>-C<sub>20</sub>-alkyl, C<sub>2</sub>-C<sub>20</sub>-alkenyl, C<sub>6</sub>-C<sub>20</sub>-

aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or  $\text{SiR}^{11\text{B}}_3$ , where the organic radicals  $\text{R}^{7\text{B}}-\text{R}^{10\text{B}}$  may also bear halogens or nitrogen or further  $\text{C}_1-\text{C}_{20}$ -alkyl groups,  $\text{C}_2-\text{C}_{20}$ -alkenyl groups,  $\text{C}_6-\text{C}_{20}$ -aryl groups, alkylaryl groups having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or  $\text{SiR}^{11\text{B}}_3$  as substituents and two vicinal radicals  $\text{R}^{7\text{B}}-\text{R}^{10\text{B}}$  may also be joined to form a five- or six-membered ring,

$\text{R}^{11\text{B}}$  are each, independently of one another, hydrogen,  $\text{C}_1-\text{C}_{20}$ -alkyl,  $\text{C}_2-\text{C}_{20}$ -alkenyl,  $\text{C}_6-\text{C}_{20}$ -aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals  $\text{R}^{11\text{B}}$  may also be joined to form a five- or six-membered ring,

$p$  is 0 when  $\text{E}^{1\text{B}}-\text{E}^{4\text{B}}$  is nitrogen and is 1 when  $\text{E}^{1\text{B}}-\text{E}^{4\text{B}}$  is carbon,

where at least one radical  $\text{R}^{7\text{B}}-\text{R}^{10\text{B}}$  is  $\text{C}_1-\text{C}_{20}$ -alkyl,  $\text{C}_2-\text{C}_{20}$ -alkenyl,  $\text{C}_6-\text{C}_{20}$ -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or  $\text{SiR}^{11\text{B}}_3$  and the organic radicals  $\text{R}^{7\text{B}}-\text{R}^{10\text{B}}$  may also bear halogens or nitrogen or further  $\text{C}_1-\text{C}_{20}$ -alkyl groups,  $\text{C}_2-\text{C}_{20}$ -alkenyl groups,  $\text{C}_6-\text{C}_{20}$ -aryl groups, alkylaryl groups having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or  $\text{SiR}^{5\text{C}}_3$  as substituents and two vicinal radicals  $\text{R}^{7\text{B}}-\text{R}^{10\text{B}}$  may also be joined to

form a five- or six-membered ring or at least one  $E^{1B}-E^{4B}$  is nitrogen;

- B) optionally, an organic or inorganic support;
- C) optionally, at least one activating compound; and
- D) optionally, at least one activating compound containing a metal of group 1, 2 or 13 of the Periodic Table;

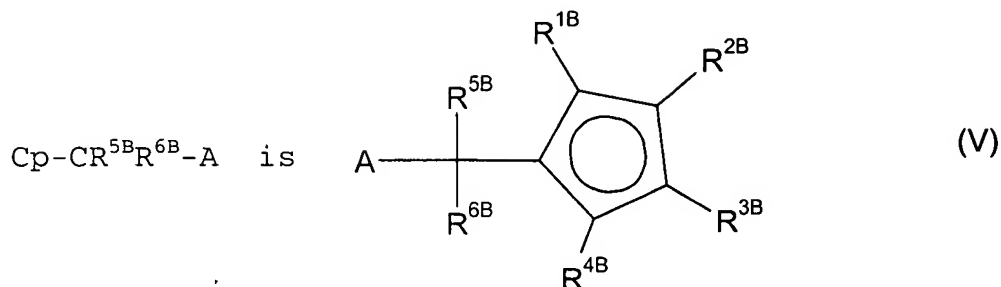
and linear  $C_2-C_{10}$ -1-alkenes polymerized onto the catalyst system, wherein the catalyst system to polymer polymerized onto the catalyst system is in a mass ratio of from 1:0.1 to 1:200; and

wherein the prepolymerized catalyst system produces a copolymer of ethylene with  $\alpha$ -olefins which comprises a molar mass distribution  $M_w/M_n$  of from 1 to 8, a density of from 0.85 to 0.94 g/cm<sup>3</sup>, a molar mass  $M_n$  of from 10,000 g/mol to 4,000,000 g/mol, a CDBI of less than 50%, a vinyl group content of from 0.1 to 1 vinyl groups/1000 carbon atoms, the copolymer comprising at least a bimodal short chain branching distribution, and wherein a side chain branching of the maxima of the individual peaks of the short chain branching distribution, as determined by crystallization analysis fractionation (CRYSTAF), of the copolymer of ethylene and the  $\alpha$ -olefins is greater than 5 CH<sub>3</sub>/1000 carbon atoms.

24. (Currently Amended) A process comprising copolymerizing ethylene with  $\alpha$ -olefins in the presence of a catalyst system comprising:

- A') at least one monocyclopentadienyl complex A') comprising a structural feature of the formula. (Cp-

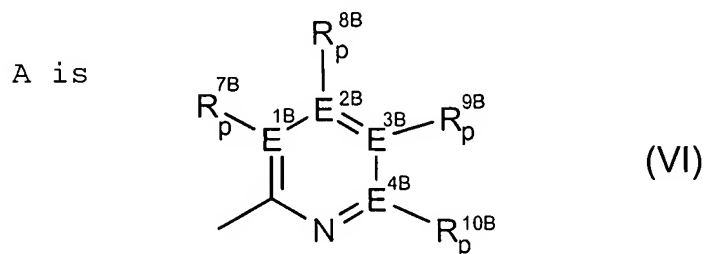
$\text{CR}^{5\text{B}}\text{R}^{6\text{B}}-\text{A})\text{Cr}$  (IV), where the variables have the following meanings:



where

$\text{R}^{1\text{B}}-\text{R}^{4\text{B}}$  are each, independently of one another, hydrogen,  $\text{C}_1-\text{C}_{20}$ -alkyl,  $\text{C}_2-\text{C}_{20}$ -alkenyl,  $\text{C}_6-\text{C}_{20}$ -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl radical and 6-20 carbon atoms in the aryl radical,  $\text{NR}^{5\text{A}}_2$ ,  $\text{N}(\text{SiR}^{11\text{B}}_3)_2$ ,  $\text{OR}^{11\text{B}}$ ,  $\text{OSiR}^{11\text{B}}_3$ ,  $\text{SiR}^{11\text{B}}_3$ ,  $\text{BR}^{11\text{B}}_2$ , where the organic radicals  $\text{R}^{1\text{B}}-\text{R}^{4\text{B}}$  may also be substituted by halogens and two vicinal radicals  $\text{R}^{1\text{B}}-\text{R}^{4\text{B}}$  may also be joined to form a five- or six-membered ring,

$\text{R}^{5\text{B}}, \text{R}^{6\text{B}}$  are each hydrogen or methyl;



where

$\text{E}^{1\text{B}}-\text{E}^{4\text{B}}$  are each carbon or nitrogen,

$\text{R}^{7\text{B}}-\text{R}^{10\text{B}}$  are each, independently of one another, hydrogen,  $\text{C}_1-\text{C}_{20}$ -alkyl,  $\text{C}_2-\text{C}_{20}$ -alkenyl,  $\text{C}_6-\text{C}_{20}$ -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon

atoms in the aryl part or  $\text{SiR}^{11\text{B}}_3$ , where the organic radicals  $\text{R}^{7\text{B}}-\text{R}^{10\text{B}}$  may also bear halogens or nitrogen or further  $\text{C}_1-\text{C}_{20}$ -alkyl groups,  $\text{C}_2-\text{C}_{20}$ -alkenyl groups,  $\text{C}_6-\text{C}_{20}$ -aryl groups, alkylaryl groups having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or  $\text{SiR}^{11\text{B}}_3$  as substituents and two vicinal radicals  $\text{R}^{7\text{B}}-\text{R}^{10\text{B}}$  may also be joined to form a five- or six-membered ring,

$\text{R}^{11\text{B}}$  are each, independently of one another, hydrogen,  $\text{C}_1-\text{C}_{20}$ -alkyl,  $\text{C}_2-\text{C}_{20}$ -alkenyl,  $\text{C}_6-\text{C}_{20}$ -aryl or alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part and two radicals  $\text{R}^{11\text{B}}$  may also be joined to form a five- or six-membered ring,

$p$  is 0 when  $\text{E}^{1\text{B}}-\text{E}^{4\text{B}}$  is nitrogen and is 1 when  $\text{E}^{1\text{B}}-\text{E}^{4\text{B}}$  is carbon,

where at least one radical  $\text{R}^{7\text{B}}-\text{R}^{10\text{B}}$  is  $\text{C}_1-\text{C}_{20}$ -alkyl,  $\text{C}_2-\text{C}_{20}$ -alkenyl,  $\text{C}_6-\text{C}_{20}$ -aryl, alkylaryl having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or  $\text{SiR}^{11\text{B}}_3$  and the organic radicals  $\text{R}^{7\text{B}}-\text{R}^{10\text{B}}$  may also bear halogens or nitrogen or further  $\text{C}_1-\text{C}_{20}$ -alkyl groups,  $\text{C}_2-\text{C}_{20}$ -alkenyl groups,  $\text{C}_6-\text{C}_{20}$ -aryl groups, alkylaryl groups having from 1 to 10 carbon atoms in the alkyl part and 6-20 carbon atoms in the aryl part or  $\text{SiR}^{5\text{C}}_3$  as substituents and two vicinal radicals  $\text{R}^{7\text{B}}-\text{R}^{10\text{B}}$  may also be joined to form a five- or six-membered ring or at least one  $\text{E}^{1\text{B}}-\text{E}^{4\text{B}}$  is nitrogen;

B) optionally, an organic or inorganic support;

C) optionally, at least one activating compound; and  
D) optionally, at least one metal compound containing a metal of group 1, 2 or 13 of the Periodic Table;  
wherein the process produces a copolymer of ethylene with  $\alpha$ -olefins which comprises a molar mass distribution  $M_w/M_n$  of from 1 to 8, a density of from 0.85 to 0.94 g/cm<sup>3</sup>, a molar mass  $M_n$  of from 10,000 g/mol to 4,000,000 g/mol, a CDBI of less than 50%, a vinyl group content of from 0.1 to 1 vinyl groups/1000 carbon atoms, the copolymer comprising at least a bimodal short chain branching distribution, and wherein a side chain branching of the maxima of the individual peaks of the short chain branching distribution, as determined by crystallization analysis fractionation (CRYSTAF), of the copolymer of ethylene and the  $\alpha$ -olefins is greater than 5 CH<sub>3</sub>/1000 carbon atoms.

25. (Cancelled)

26. (Previously presented) The process as claimed in claim 25, wherein the polymerization is carried out using, as monomers, a monomer mixture which comprises at least one of ethylene and C<sub>3</sub>-C<sub>12</sub>-1-alkenes and contains at least 50 mol% of ethylene.

27. (Currently Amended) A polymer mixture comprising

(E) from 1 to 99% by weight of at least one ethylene copolymer comprising a molar mass distribution  $M_w/M_n$  of from 1 to 8, a density of from 0.85 to 0.94 g/cm<sup>3</sup>, a molar mass  $M_n$  of from 10,000 g/mol to

4,000,000 g/mol, a CDBI of less than 50%, a vinyl group content of from 0.1 to 1 vinyl groups/1000 carbon atoms, the copolymer comprising at least a bimodal short chain branching distribution, and wherein a side chain branching of the maxima of the individual peaks of the short chain branching distribution, as determined by crystallization analysis fractionation (CRYSTAF), of the ethylene copolymer is greater than 5 CH<sub>3</sub>/1000 carbon atoms;

and

(F) from 1 to 99% by weight of a polymer which is different from (E),  
where the percentages by weight are based on the total mass of the polymer mixture.

28. (Currently Amended) A fiber, film or molding comprising an ethylene copolymer comprising a molar mass distribution  $M_w/M_n$  of from 1 to 8, a density of from 0.85 to 0.94 g/cm<sup>3</sup>, a molar mass  $M_n$  of from 10,000 g/mol to 4,000,000 g/mol, a CDBI of less than 50%, a vinyl group content of from 0.1 to 1 vinyl groups/1000 carbon atoms, the copolymer comprising at least a bimodal short chain branching distribution, and wherein a side chain branching of the maxima of the individual peaks of the short chain branching distribution, as determined by crystallization analysis fractionation (CRYSTAF), of the ethylene copolymer is greater than 5 CH<sub>3</sub>/1000 carbon atoms.

29. (Previously Presented) The process of claim 20 where L is carbon.